

Compliance Document for New Zealand Building Code Clause H1 Energy Efficiency – Second Edition

Prepared by the Department of Building and Housing

This Compliance Document is prepared by the Department of Building and Housing. The Department of Building and Housing is a Government Department established under the State Sector Act 1988.

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ISBN 0-477-01606-5

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Users should make themselves familiar with the preface to the New Zealand Building Code Handbook, which describes the status of Compliance Documents and explains alternative methods of achieving compliance.

Defined words (italicised in the text) and classified uses are explained in Clauses A1 of the Building Code and in the Definitions at the start of this Compliance Document.

H1: Document History		
	Date	Alterations
First published	July 1992	
Second edition	29 December 2000	Document revised – second edition issued.
Amendment 1	1 July 2001	p. 2, Document History, Status p. 5, Classified uses
Note: Page numbers relate to the document at the time of Amendment and may not match page numbers in current document.		

Document Status

The most recent version of this document, as detailed in the Document History, is approved by the Chief Executive of the Department of Building and Housing. It is effective from 1 July 2001 and supersedes all previous versions of this document.

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New Zealand Building Code

Clause H1 Energy Efficiency

The mandatory provisions for building work are contained in the New Zealand Building Code (NZBC), which comprises the First Schedule to the Building Regulations 1992. The relevant NZBC Clause for Energy Efficiency is H1, as amended 26 June 2000.

r 4	Building Amendment Regulations 2000	2000/119		
<p>5 Clause H1 of code (energy efficiency provisions) replaced</p> <p>The First Schedule of the principal regulations is amended by revoking clause H1, and substituting the following clause:</p>				
<p>Clause H1—Energy efficiency provisions</p> <table border="0"> <tr> <td style="vertical-align: top;"> <p>Provisions</p> <p>Objective</p> <p>H1.1 The objective of this provision is to facilitate efficient use of energy.</p> <p>Functional requirement</p> <p>H1.2 Buildings must be constructed to achieve an adequate degree of energy efficiency when that energy is used for—</p> <p>(a) modifying temperature or humidity, or both; or</p> <p>(b) providing hot water to sanitary fixtures or sanitary appliances, or both; or</p> <p>(c) providing artificial lighting</p> <p>Performance</p> <p>H1.3.1 The building envelope enclosing spaces where the temperature or humidity (or both) are modified must be constructed to—</p> <p>(a) provide adequate thermal resistance; and</p> <p>(b) limit uncontrollable airflow.</p> <p>H1.3.2 Buildings must be constructed to ensure that the building performance index does not exceed:</p> <p>(a) 0.13 kWh in a warm location; and</p> <p>(b) 0.12 kWh in a cool location.</p> </td> <td style="vertical-align: top;"> <p>Limits on application</p> <p>Objective H1.1 applies only when the energy is sourced from a network utility operator or a depletable energy resource.</p> <p>Requirement H1.2(a) does not apply to assembly service buildings, industrial buildings, outbuildings, or ancillary buildings, or to plant and equipment provided to modify temperature, humidity, or both.</p> <p>Requirement H1.2(c) applies only to commercial buildings and communal non-residential buildings whose floor area is greater than 300 m².</p> <p>Performance H1.3.2 applies only to housing.</p> </td> </tr> </table>			<p>Provisions</p> <p>Objective</p> <p>H1.1 The objective of this provision is to facilitate efficient use of energy.</p> <p>Functional requirement</p> <p>H1.2 Buildings must be constructed to achieve an adequate degree of energy efficiency when that energy is used for—</p> <p>(a) modifying temperature or humidity, or both; or</p> <p>(b) providing hot water to sanitary fixtures or sanitary appliances, or both; or</p> <p>(c) providing artificial lighting</p> <p>Performance</p> <p>H1.3.1 The building envelope enclosing spaces where the temperature or humidity (or both) are modified must be constructed to—</p> <p>(a) provide adequate thermal resistance; and</p> <p>(b) limit uncontrollable airflow.</p> <p>H1.3.2 Buildings must be constructed to ensure that the building performance index does not exceed:</p> <p>(a) 0.13 kWh in a warm location; and</p> <p>(b) 0.12 kWh in a cool location.</p>	<p>Limits on application</p> <p>Objective H1.1 applies only when the energy is sourced from a network utility operator or a depletable energy resource.</p> <p>Requirement H1.2(a) does not apply to assembly service buildings, industrial buildings, outbuildings, or ancillary buildings, or to plant and equipment provided to modify temperature, humidity, or both.</p> <p>Requirement H1.2(c) applies only to commercial buildings and communal non-residential buildings whose floor area is greater than 300 m².</p> <p>Performance H1.3.2 applies only to housing.</p>
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2000/119

Building Amendment Regulations 2000

r 5

Provisions

H1.3.3 Account must be taken of physical conditions likely to affect energy performance of *buildings*, including—

- (a) the thermal mass of *building elements*; and
- (b) the building orientation and shape; and
- (c) the airtightness of the building envelope; and
- (d) the heat gains from services, processes and occupants; and
- (e) the local climate; and
- (f) heat gains from solar radiation.

H1.3.4 Systems for the heating, storage, or distribution of hot water to *sanitary fixtures* or *sanitary appliances* must, having regard to the energy source used,—

- (a) limit the energy lost in the heating process; and
- (b) be constructed to limit heat losses from storage vessels, and from distribution systems connected to storage vessels.

H.1.3.5 Artificial lighting fixtures must—

- (a) be located and sized to limit energy use, consistent with the *intended use* of space; and
- (b) be fitted with a means to enable light intensities to be reduced, consistent with reduced activity in the space.

Limits on application

Performance H1.3.4(b) applies only where individual storage vessels are 700 litres or less in capacity.

Performance H1.3.5 does not apply to lighting provided solely to meet the requirements of clause F6.

Marie Shroff,
Clerk of the Executive Council.

New Zealand Building Code

Clause A1 Classified Uses

Amend 1
Jul 2001

The regulatory classification of buildings according to use is contained in the New Zealand Building Code (NZBC), which comprises the First Schedule to the Building Regulations 1992. The relevant NZBC clause for Classified Uses is A1.

FIRST SCHEDULE—continued

Clause A1—CLASSIFIED USES

1.0 EXPLANATION

1.0.1 For the purposes of this building code *buildings* are classified according to type, under seven categories.

1.0.2 A *building* with a given classified use may have one or more *intended uses* as defined in the Act.

2.0 HOUSING

2.0.1 Applies to *buildings* or use where there is self care and service (internal management). There are three types.

2.0.2 Detached Dwellings

Applies to a *building* or use where a group of people live as a single household or family. Examples: a holiday cottage, boarding house accommodating fewer than 6 people, dwelling or hut.

2.0.3 Multi-unit Dwelling

Applies to a *building* or use which contains more than one separate household or family. Examples: an attached dwelling, flat or multi-unit apartment.

2.0.4 Group Dwelling

Applies to a *building* or use where groups of people live as one large extended family. Examples: within a commune or marae.

3.0 COMMUNAL RESIDENTIAL

3.0.1 Applies to *buildings* or use where assistance or care is extended to the *principal users*. There are two types.

3.0.2 Community Service

Applies to a residential *building* or use where limited assistance or care is extended to the *principal users*. Examples: a boarding house, hall of residence, holiday cabin, hostel, hotel, motel, nurse's home, retirement village, time-share accommodation, a work camp, or camping ground.

3.0.3 Community Care

Applies to a residential *building* or use where a large degree of assistance or care is extended to the *principal users*. There are two types:

- (a) **Unrestrained;** where the *principal users* are free to come and go. Examples: a hospital, an old people's home or a health camp.
- (b) **Restrained;** where the *principals users* are legally or physically constrained in their movements. Examples: a borstal or drug rehabilitation centre, an old people's home where substantial care is extended, a prison or hospital.

4.0 COMMUNAL NON-RESIDENTIAL

4.0.1 Applies to a *building* or use being a meeting place for people where care and service is provided by people other than the *principal users*. There are two types.

FIRST SCHEDULE—continued**4.0.2 Assembly Service**

Applies to a *building* or use where limited care and service is provided. Examples: a church, cinema, clubroom, hall, museum, public swimming pool, stadium, theatre, or whare runanga (the assembly house).

4.0.3 Assembly Care

Applies to a *building* or use where a large degree of care and service is provided. Examples: an early childhood centre, college, day care institution, centre for handicapped persons, kindergarten, school or university.

5.0 COMMERCIAL

5.0.1 Applies to a *building* or use in which any natural resources, goods, services or money are either developed, sold, exchanged or stored. Examples: an amusement park, auction room, bank, car-park, catering facility, coffee bar, computer centre, fire station, funeral parlour, hairdresser, library, office (commercial or government), police station, post office, public laundry, radio station, restaurant, service station, shop, showroom, storage facility, television station or transport terminal.

6.0 INDUSTRIAL

6.0.1 Applies to a *building* or use where people use material and physical effort to:

- (a) extract or convert natural resources,
- (b) produce goods or energy from natural or converted resources,
- (c) repair goods, or
- (d) store goods (ensuing from the industrial process).

Examples: an agricultural building, agricultural processing facility, aircraft hanger, factory, power station, sewage treatment works, warehouse or utility.

7.0 OUTBUILDINGS

7.0.1 Applies to a *building* or use which may be included within each classified use but are not intended for human habitation, and are accessory to the principal use of associated *buildings*. Examples: a carport, farm *building*, garage, greenhouse, machinery room, private swimming pool, public toilet, or shed.

8.0 ANCILLARY

8.0.1 Applies to a *building* or use not for human habitation and which may be exempted from some amenity provisions, but which are required to comply with structural and safety-related aspects of the *building code*. Examples: a bridge, derrick, fence, free standing outdoor fireplace, jetty, mast, path, platform, pylon, retaining wall, tank, tunnel or dam.

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References

For the purposes of New Zealand Building Code compliance, acceptable reference documents include only the quoted edition and specific amendments listed below.

Standards New Zealand

NZS 4214: 1977	Methods of determining the total thermal resistance of parts of buildings
NZS 4218: 1996	Energy efficiency – housing and small building envelope
NZS 4243: 1996	Energy efficiency – large buildings
NZS 4305: 1996	Energy efficiency – domestic type hot water systems

BRANZ

ALF Manual: 1990	Annual loss factor design manual. An aid to thermal design of buildings M.R. Bassett, R.C. Bishop and I.S van der Werff
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BRANZ House Insulation Guide: 1995

New Zealand Meteorological Service

Average degree-day tables – selected NZ stations
(Miscellaneous publication 159, 1978)

Where quoted

VM1 1.4.1, AS1 2.3.1

VM1 1.1.1,
AS1 2.1.1, 2.2.2, 4.0.1

VM1 1.3.1,
AS1 4.0.1, 6.1.1

AS1 5.0.1

Definition – BPI,
VM1 1.2.1

VM1 1.4.1, AS1 2.3.

Definition –
degree-day total

COMMENT:

This publication is no longer available, but the relevant information is summarised in the Degree-days data sheets of the ALF Manual referenced above.

Definitions

The full list of definitions for italicised words may be found in the New Zealand Building Code Handbook.

Note: Classified uses for *buildings*, as described in Clause A1 of the First Schedule to the Building Regulations 1992, are printed in SMALL CAPITALS in these documents. Clause A1 is reprinted at the front of this publication.

Adequate *Adequate* to achieve the objectives of the *building code*.

Building has the meaning ascribed to it by the Building Act 1991.

Building code means the *building code* made under Part VI of the Building Act 1991, being the *building code* set out in the First Schedule to the Building Regulations.

Building element Any structural or non-structural component or assembly incorporated into or associated with a *building*. Included are *fixtures*, services, *drains*, permanent mechanical installations for access, glazing, partitions, ceilings and temporary supports.

Building performance index (BPI), in relation to a *building*, means the energy from a *network utility operator* or a depletable resource (measured in kilowatt-hours per square metre of floor area and per *degree-day*, and calculated using the Building Research Association of New Zealand's Annual Loss Factor Design Manual 1990 or some other method that can be correlated with that manual) needed to maintain the *building* at a constant internal temperature for the period from 1 May to the close of 31 August under the following standard conditions:

- a) A continuous temperature of 20°C throughout the *building*.
- b) An air change rate of 1 change per hour or the actual air leakage rate, whichever is the greater.
- c) A heat emission contribution arising from internal heat sources for the period being considered of 1000 kWh for the first 50 m² of floor area and 10 kWh for every additional square metre of floor area.

d) No allowance for –

- i) carpets, or
 - ii) blinds, curtains, or drapes, on windows.
- e) Windows to have a shading coefficient of 0.6 (made up of 0.8 for windows and recesses and 0.75 for site shading).

Construct in relation to a *building*, includes to build, erect, prefabricate, and relocate; and **construction** has a corresponding meaning.

Cool location means a location in New Zealand where the *degree-day total* is 920 or more.

Degree-day in relation to any location on any day, –

- a) If a base temperature of 15°C is greater than the mean of the maximum and minimum outdoor temperatures at that location on that day, means the number of degrees Celsius by which that base temperature is greater than that mean.
- b) If a base temperature of 15°C is not greater than the mean of the maximum and minimum outdoors temperatures at that location on that day, means zero.

Degree-day total in relation to any location, means the sum of the *degree-days* for that location for the period of 1 May to 31 August, as derived from Average Degree-day Tables – Selected NZ Stations (Miscellaneous Publication 159, 1978 of the New Zealand Meteorological Service).

Fixture An article intended to remain permanently attached to and form part of a *building*.

Household unit means any *building* or group of *buildings*, or part of any *building* or group of *buildings*, used or intended to be used solely or principally for residential purposes and occupied or intended to be occupied exclusively as the home or residence of not more than one household; but does not include a hostel or boardinghouse or other specialised accommodation.

Intended use of a *building* includes:

- a) Any reasonably foreseeable occasional other use that is not incompatible with the *intended use*; and
- b) Normal maintenance; and
- c) Activities taken in response to *fire* or any other reasonably foreseeable emergency – but does not include any other maintenance and repairs or rebuilding.

Network utility operator means a *person* who:

- a) Undertakes the distribution or transmission by pipeline of natural or manufactured gas, petroleum, or geothermal energy; or
- b) Is an electricity operator or electrical distributor as defined by section 2(1) of the Electricity Act 1992 for the purposes of any works defined by that Act; or
- c) Undertakes the piped distribution of potable water for supply; or
- d) Is the operator of a sewerage system or a stormwater drainage system.

Person includes the Crown, a corporation sole, and also a body of *persons*, whether corporate or unincorporated.

R-value The common abbreviation for describing the values of both *thermal resistance* and *total thermal resistance*.

Sanitary appliance An appliance which is intended to be used for *sanitation* and which is not a *sanitary fixture*. Included are machines for washing dishes and clothes.

Sanitary fixture Any *fixture* which is intended to be used for *sanitation*.

Sanitation The term used to describe the activities of washing and/or excretion carried out in a manner or condition such that the effect on health is minimised, with regard to dirt and infection.

Thermal resistance The resistance to heat flow of a given component of a *building element*. It is equal to the air temperature difference (°C) needed to produce unit heat flux (W/m²) through unit area (m²) under steady conditions. The units are °Cm²/W.

Warm location means a location in New Zealand where the *degree-day total* is less than 920.

Wharenui A communal meeting house having a large open floor area used for both assembly and sleeping in the traditional Maori manner.

Verification Method H1/VM1

1.0 Building Thermal Envelope

1.1 Modelling of housing and small buildings

1.1.1 The modelling method described in NZS 4218 section 3.3 is a verification method for NZBC Clause H1.3.1 (a) for the following types of *buildings*:

- a) HOUSING regardless of total floor area, (the method is also a means of compliance with H1.3.2 which applies only to HOUSING), and
- b) Small *buildings* other than HOUSING having a total floor area of no greater than 300 m².

COMMENT:

1. Housing includes DETACHED DWELLINGS, MULTI-UNIT DWELLINGS such as *buildings* which contain more than one separate household or family e.g. an apartment *building*, and also GROUP DWELLINGS e.g. a *wharenui*.
2. The modelling method is to be applied to the whole *building* and not to each *household unit* within.

1.2 Building performance index for housing

1.2.1 The *building performance index (BPI)* may be calculated by following the procedures of the ALF Design Manual. Clause H1.3.1 (a) is satisfied by complying with the *BPI*.

COMMENT:

1. The NZBC has no requirement for the maintenance of interior temperatures except as required by NZBC G5 for old people's homes and early childhood centres. The 20°C stated in the definition of *building performance index* is for calculation purposes only.
2. To satisfy the requirements of E3/AS1 for Internal Moisture, it may be necessary, depending on the method adopted, to provide more insulation (greater *R-value*) than that required to satisfy energy efficiency provisions alone. See NZS 4218 clauses 1.3.3 and 3.2.6.
3. For *buildings* in locations where the *degree-day total* is more than about 1400 (such as alpine areas), there may be benefits in higher levels of insulation than required in the *cool location*.
4. BRANZ has published an upgraded version of ALF (ALF3 The Annual Loss Factor Method, 3rd Ed, Judgeford, BRANZ, 2000) which uses a procedure that has been correlated with ALF 1990. Note that the ALF procedures are intended for DETACHED DWELLINGS and are not suitable for MULTI-UNIT DWELLINGS.

1.3 Modelling of large buildings other than housing

1.3.1 The modelling method described in NZS 4243 section 4.7, is a verification method for NZBC Clause H1.3.1 (a) for *buildings* other than HOUSING having a total floor area greater than 300 m².

COMMENT:

1. If artificial lighting is included when applying the modelling method of NZS 4243 section 4.7, there is no need to comply separately with section 4.5 or 4.6 of that Standard.
2. Note the limit on application to NZBC Clause H1.2 (a) and H1.2 (c).

1.4 Determining thermal resistance

1.4.1 The *thermal resistance (R-values)* of *building elements* may be verified by using NZS 4214 or the BRANZ House Insulation Guide.

Acceptable Solution H1/AS1

1.0 General

1.0.1 This acceptable solution deals with HOUSING, COMMUNAL RESIDENTIAL, ASSEMBLY SERVICE, ASSEMBLY CARE and COMMERCIAL *buildings*. For determining the insulation requirements of the *building* envelope those *buildings* are classified as being either small or large. A small *building* is one having a total floor area no greater than 300 m². Note that NZBC H1.3.1 (a) (temperature and humidity control) does not apply to ASSEMBLY SERVICE *buildings*.

1.0.2 In *buildings* containing both INDUSTRIAL and other classifications, the non-industrial portion shall be treated separately according to its classification. For example, in a *building* containing both INDUSTRIAL and COMMERCIAL occupancies, the COMMERCIAL area shall meet the NZBC energy efficiency requirements.

1.0.3 The NZBC requirements for artificial lighting apply to COMMERCIAL and COMMUNAL NON-RESIDENTIAL *buildings* with a total floor area of greater than 300 m².

2.0 Building Thermal Envelope

2.1 Housing and small buildings

2.1.1 *Construction* in accordance with NZS 4218 sections 3.1 or 3.2 satisfies NZBC H1.3.1 (a) for all *buildings* having a total floor area of no greater than 300 m², and also satisfies NZBC H1.3.2 for HOUSING of any size, including the external walls of MULTI-UNIT DWELLINGS. (Note that common walls between *household units* of MULTI-UNIT DWELLINGS need not comply with NZS 4218.)

COMMENT:

1. Section 3.2 "calculation method" of NZS 4218 compares the proposed *building* with the "reference building" which is insulated in accordance with Tables 1 and 2. This method permits wall, floor and ceiling insulation combinations which differ from Tables 1 and 2, but the *building* must still perform at least as well as the "reference building" used in Tables 1 and 2.

2. Thermal mass, such as provided by exposed concrete floors and earth walls, in conjunction with solar design, can give improved energy efficiency.

3. To satisfy the requirements of E3/AS1 for Internal Moisture, it may be necessary, depending on the method adopted, to provide more insulation (greater *R-value*) than that required to satisfy energy efficiency provisions alone.

4. Table 2 of NZS 4218 permits *buildings* of solid construction to have lower *R-values* than *buildings* of non-solid construction. This results from taking account of the different costs and benefits to the *building* owner of adding extra insulation to certain types of construction. 'Solid construction' does not mean the full wall thickness must consist of the same material throughout.

2.2 Large buildings other than housing

2.2.1 *Construction* in accordance with NZS 4243 section 4.3 or 4.4 satisfies the requirements of NZBC H1.3.1 (a) for the *thermal resistance* of the *building* envelope in *buildings* other than HOUSING having a total floor area of greater than 300 m².

2.2.2 NZS 4218 is an alternative acceptable solution for *buildings* with a floor area of greater than 300 m² but may exceed the requirements of the NZBC H1.3.1 (a).

2.3 Determining thermal resistance

2.3.1 Acceptable methods for determining the *thermal resistance (R-values)* of *building elements* are contained in NZS 4214 and in the BRANZ House Insulation Guide.

3.0 Control of Airflow

3.0.1 To limit uncontrollable airflow to or from spaces where the temperature or humidity or both are modified as required by NZBC H1.3.1(b), *buildings* shall have windows, doors, vents or other *building elements* which allow significant movement of air, *constructed* in such a way that they are capable of being fixed in the closed position.

COMMENT:

G4/AS1 provides for the supply of outdoor air for ventilation by way of windows and doors that can be fixed in the open position.

4.0 Control of Solar Heat Gain

4.0.1 The requirements of NZBC H1.3.3 (f) are satisfied by complying with either NZS 4218 for small *buildings* or NZS 4243 for large *buildings*.

5.0 Hot Water Systems

5.0.1 Hot water systems complying with NZS 4305, as modified in Paragraphs 5.0.2 and 5.0.3, satisfy the requirements of NZBC H1.3.4 for the provision of hot water to *sanitary fixtures* and *sanitary appliances*.

COMMENT:

NZS 4305 deals with domestic type electrical and gas systems having a storage water heater capacity of up to 700 litres. Larger systems and their associated piping are not controlled by the NZBC.

5.0.2 NZS 4305 is modified by deleting “shall” in the first sentence of clause 3.3.1 and replacing with “should”.

COMMENT:

When NZS 4305 was published it was assumed valve insulation packages would be readily available. This is not the case at the date of this document, therefore insulation of these valves is not mandatory to comply with the NZBC.

5.0.3 NZS 4305 is modified by deleting clauses 2.1.1 and 2.1.2 and Tables 1 and 2 and substituting the following:

“**2.1.1** Electric storage water heaters shall have a minimum insulation material thickness of 25 mm. The insulation material shall have a thermal conductivity of less than 24 mW/m°C when tested to ASTM C518-76.”

COMMENT:

Table 1 in NZS 4305 gives the ‘A’ grade electric water heater performance. Water heaters with ‘A’ grade performance cannot be manufactured in sufficient numbers as at the date of this document because of the limit imposed by Government on the import of the HCFC insulation foaming agent, which is an ozone depleting substance.

6.0 Artificial Lighting

6.1 Commercial, assembly service and assembly care buildings

6.1.1 Artificial lighting energy consumption in COMMERCIAL, ASSEMBLY SERVICE and ASSEMBLY CARE *buildings* having a total floor area of greater than 300 m² shall comply with NZS 4243 clause 4.5 or 4.6 to satisfy the requirements of NZBC H1.3.5.

Index H1/VM1 & AS1

All references to Verification Methods and Acceptable Solutions are preceded by **VM** or **AS** respectively.

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thermal resistance (R-value)	.VM1 1.4, .AS1 2.1.1, 2.2, 2.3

Energy efficiency provisions

airflow control	.AS1 3.0
artificial lighting	.AS1 1.0.3, 6.0
building performance index (BPI)	.VM1 1.2
hot water systems	.AS1 5.0
internal moisture	.VM1 1.2.1, .AS1 2.1.1
solar heat gain	.AS1 4.0

